

AMENDMENTS TO THE SPECIFICATION

Pages 13 and 14, bridging paragraph:

Moreover, in the portion of the lock pin receiving hole 50 in the proximity of the outer peripheral surface of the case 12 is inserted a bushing 52 having a non-through hole 52a, and this bushing 52 is positioned and secured thereon by a shaft 53 inserted therein along an orthogonal direction crossing the axial direction of the lock pin receiving hole 50. Between the non-through hole 52a of the bushing 52 and the non-through holes 51b of the lock pin 51 opposing to the non-through hole 52a is provided a coil spring 54 that continuously urges the lock pin 51 in the direction of arrow Z1. At the bottom of the non-through hole 52a of the bushing 52 is formed a back pressure drain passage 52b for exhausting back pressure developed within the lock pin receiving hole 50, to the atmosphere, when the lock pin 51 retreats in the direction of arrow Z2.

Pages 14-15, bridging paragraph:

Moreover, within the slider receiving hole 55 is provided a slider (closing member) 58 that is slidable in an axial direction of the slider receiving hole 55, and a bushing 59 is press-fitted into a position located in the proximity of the outer peripheral surface 30f of the rotor 30, in the slider receiving hole 55. The slider 58 is a sliding member that pushes back in the direction of arrow Z2 the lock pin 51 to be engaged with an engaging hole 59a of the bushing

bushing 59 press-fitted into the slider receiving hole 55 against the urging force of the coil spring 54. The slider is generally composed of a thin portion 58a having an external diameter substantially equal to that of the pin body 51a of the lock pin 51; a thick portion 58b located closer to the bottom 55a side of the slider receiving hole 55 than this thin portion 58a; and a concave 58c formed on the bottom of this thick portion 58b for forming an internal space between the bottom of the slider 58 and the bottom 55a of the slider receiving hole 55, which causes hydraulic pressure supplied to the slider receiving hole 55 from the third oil passage 56 to promptly act on the whole bottom of the slider 58 even when the slider 58 retreats and is in contact with the bottom 55a of the slider receiving hole 55.

Pages 15-16, bridging paragraph, continuing onto page 17:

Within the bushing 59 is formed the engaging hole 59a passing through the bushing in an axial direction of the bushing and engaging therein the lock pin 51. The inner peripheral surface of the engaging hole 59a has an internal diameter enough for the pin body 51a of the lock pin 51 and the thin portion 58a of the slider 58 to slide therein, and the axial length of the engaging hole is arranged to be substantially equal to that of the thin portion 58a of the slider 58. Therefore, as shown in FIG. 4, when the thin portion 58a of the slider 58 slid by hydraulic pressure, in the direction of arrow Z2 within the engaging hole 59a of the bushing 59, the tip end surface 58d of the thin portion 58a of the slider 58 becomes substantially flush with the top surface 59c of the bushing 59 at the time the slide is

stopped by the abutment of the thick portion 58b of the slider 58 on bottom surface 59b of the [[bush]] bushing 59. At that time, because the outer peripheral surface 30f of the rotor 30, the top surface 59c of the [[bush]] bushing 59, and the tip end surface 58d of the slider 58 are consecutively subject to the slide of the tip end surface 51c of the lock pin 51 when the lock pin 51 retreats in the direction of arrow Z1 (in the lock releasing state), ideally, each of the above-mentioned surfaces should be flush with one another. However, as a practical matter, it is necessary to consider errors in the machining accuracy in the assembly stage. That is, as shown in FIG. 5, when the top surface 59c of the [[bush]] bushing 59 is retained within the slider receiving hole 55 formed on the lower side such that the top surface does not project outwardly from the outer peripheral surface 30f of the rotor 30, and further the tip end surface 58d of the thin portion 58a of the slider 58 sliding within the engaging hole 59a of the [[bush]] bushing 59, slightly project from the top surface 59c of the [[bush]] bushing 59, the top surface 59c of the [[bush]] bushing 59 will slightly be recessed from the outer peripheral surface 30f of the rotor 30 and the tip end surface 58d of the slider 58. However, since the width of the recess is much shorter than that of the lock pin 51, the lock pin 51 does not go in the above-mentioned recess, nor does it stick therein, which allows smooth sliding of the lock pin 51 on the outer peripheral surface 30f of the rotor 30. In addition, as shown in FIG. 5, the convexly curved tip end surface 51c of the lock pin 51 relative to the slider receiving hole 55 avoids sticking the corner of the tip end surface 51c of the lock pin 51 in the recess, thereby ensuring the stability of the relative rotation between the case 12 and the rotor 30. If it is tentatively arranged without entirely considering errors in the machining accuracy, that the top surface 59c of the [[bush]] bushing 59 and the tip

end surface 58d of and the slider 58 becomes flush with each other relative to the outer peripheral surface 30f of the rotor 30, there is a possibility that the tip end surface 58d of the slider 58 will lower from the top surface 59c of the [[bush]] bushing 59, with the result that the lock pin 51 will engage with the recess when the length of the thin portion 58a of the slider 58 is shorter than that of the engaging hole 59a of the [[bush]] bushing 59. Conversely, when the length of the thin portion 58a of the slider 58 is longer than that of the engaging hole 59a of the [[bush]] bushing 59, it is feared that the tip end surface 58d of the slider 58 will project from the outer peripheral surface 30f of the rotor 30 and the top surface 59c of the [[bush]] bushing 59, and the lock pin 51 will stick thereon, which blocks the relative rotation between the case 12 and the rotor 30.

Pages 17-18, bridging paragraph:

First of all, because the oil pump 41 shown in FIG. 6 is not driven when the engine is stopped, the remaining oil in the valve timing adjusting apparatus 1, in the first oil passage 38, and in the second oil passage 39 is flowed down to the oil pan 42. At that time, since the opening/closing control valve 57 is closed, and the hydraulic pressure is not supplied to the third oil passage 56, lock releasing hydraulic pressure is not supplied into the slider receiving hole 55 from the third oil passage 56, and the slider 58 in the slider receiving hole 55 does not act on the lock pin 51. Therefore, as shown in FIG. 3, the lock pin 51 slides in the direction of arrow Z1 by the urging force of the coil spring 54, and engages with the engaging hole 59a of the [[bush]]

bushing 59. The tip end surface 51c of the lock pin 51 abuts the tip end surface 58d of the thin portion 58a of the slider 58, thereby retreating the slider into a retreating space 55b on the bottom 55a side of the slider receiving hole 55. This regulates the relative rotation between the case 12 and the rotor 30 (the locking state).

Pages 19-20, bridging paragraph:

Then, when the engine warming up is ended, the oil gets to have a high temperature and a low viscosity. At this stage, it becomes fairly possible to control the relative rotation between the first rotor and the second rotor of the valve timing adjusting apparatus 1 at the desired position. Now, upon giving a control instruction, the opening/closing control valve 57 shown in FIG. 6 is operated to change from the closing state to the opening state in which the hydraulic pressure is supplied to the third oil passage 56, and the hydraulic pressure (the lock releasing hydraulic pressure) is supplied from the third oil passage 56 to the internal space formed between the bottom 55a of the slider receiving hole 55 and the concave 58c of the slider 58. As shown in FIG. 4, the slider 58 slides by the above-mentioned hydraulic pressure in the direction of arrow Z2 until the thick portion 58b of the slider 58 abuts the bottom surface 59b of the [[bush]] bushing 59 and the thick portion stops. Further, the slider retreats the lock pin 51 into the lock pin receiving hole 50 against the urging force of the coil spring 54 to make the lock pin come out of the engaging hole 59a of the [[bush]] bushing 59 in the slider receiving hole 55, and at the same time closes the engaging hole 59a of the [[bush]] bushing 59 formed within the slider

receiving hole 55. At that time, when the lock pin 51 completely came out of the engaging hole 50, the engagement of the lock pin and the engaging hole is released, and the relative rotation between the case 12 and the rotor 30 is permitted (the lock releasing state). This lock releasing state is securely maintained, because the engaging hole 59a of the [[bush]] bushing 59 in the slider receiving hole 55 is closed by the slider 58 slid by the lock releasing hydraulic pressure as long as the lock releasing hydraulic pressure is supplied into the slider receiving hole 55 through the third oil passage 56 with the opened opening/closing control valve 57.

Page 21, 1st full paragraph:

In addition, because the advance side atmospheric pressure chamber 31b and the lag side atmospheric pressure chamber 32a adjacent to the shoe 12a of the case 12 is opened to the atmosphere through the advance side drain passage 43 and the lag side drain passage 44, and further the space corresponding to the back of the lock pin 51 within the lock pin receiving hole 50 is opened to the atmosphere through the atmosphere communicating hole (not shown) of the [[bush]] bushing 54 press-fitted in the lock pin receiving hole 50, the slider 58 is subject to extremely small sliding resistance when the slider slides in the direction of arrow Z2 by the lock releasing hydraulic pressure from the third oil passage 56. Accordingly, the slider 58 can promptly slide by the applied lock releasing hydraulic pressure to push the lock pin 51 out of the engaging hole 59a, and to close the engaging hole 59a.

Page 27, 1st full paragraph:

The feature of the second embodiment is as with the first embodiment in that in a so-called intermediate lock type of valve timing adjusting apparatus, a rotation regulating member that regulates a relative rotation between a first rotor and a second rotor is ~~slidably~~ slidably provided on the slide of the second rotor, in an axial direction of the valve timing adjusting apparatus, an engaging hole receiving therein the rotation regulating member, so-called an axial direction lock, is provided on the first rotor side, and a closing member closing the engaging hole is slidably provided in a direction orthogonally crossing the axial direction of the engaging hole, within the engaging hole.